Rebuttal Report
Of
Roger G. Morse AIA

On

ASTM
Microvacuuming
Dust Sampling Methods

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I have reviewed the reports of William E. Ewing, CIH and William E. Longo, Ph.D**.** and offer the following observations in response to claims made in those reports.

Summary of opinions in this rebuttal report:

1. The D 5755 dust method is not able to determine if there is sufficient amount of asbestos in dust to trigger regulatory requirements, and there is no scientifically reliable way to relate asbestos in dust on a surface to asbestos in air. Regulatory bodies require air measurements to determine risk or regulatory compliance.
2. As recognized by the EPA, there is great scientific uncertainty in EPA's attempt at using dust sampling in New York City and Libby, Montana.

Use of D 5755 in Hazard Assessment

Building materials that contain 1% or more asbestos by bulk sample analysis are deemed to be asbestos-containing under the OSHA, EPA NESHAPs and EPA AHERA regulations, and disturbance of these materials must be controlled. The analysis to make this determination is not performed using ASTM D5755. In fact, D5755, which reports a structure count, cannot quantify the asbestos content of materials. If dust or debris that contains 1% or more of asbestos is to be disturbed, then OSHA requires that air sampling be performed to determine worker exposures that might result from the disturbance. OSHA does not permit the substitution of dust sampling by D5755 to make this determination. For example, if a D5755 analysis were to discover asbestos on top of ceiling tiles, OSHA would still require air sampling rather than dust sampling to determine if disturbance of this material posed a risk to workers. In determining compliance with the NESHAPs regulation, EPA does not use dust sampling, it uses a "no visible emissions" (in air) standard. The EPA AHERA regulation also does not use dust sampling to determine which materials are asbestos-containing building materials. Like the OSHA and NESHAPs regulations, it uses bulk sampling for this purpose. In determining if asbestos abatement projects are satisfactorily completed, the AHERA regulation requires air sampling, not dust sampling.

While D5755 can be used to determine if asbestos is or is not present in dust on a surface, the dust methodology does not, and cannot, determine the airborne exposures that may result from a disturbance of this dust. Air sampling is required for this purpose. As I described in my initial report, exposure to asbestos is an inhalation risk, so only air sampling can determine exposures and hence risk. As such, D5755 may inform an industrial hygienist of the presence or

absence of asbestos, but does not allow a risk assessment. To be able to make a risk assessment it would be necessary to determine the relationship between the index of asbestos on a surface as measured by D5755 and airborne levels of asbestos that may result from a particular disturbance of the surface. As I discussed in my previous report**,** attempts to develop such a relationship are problematic and unproven. The EPA's attempts to make use of dust sampling illustrate this fact.

EPA Use of Dust Sampling

The EPA has announced that it is using the D5755 dust sampling method in two situations. One is evaluation of dust in the area of Manhattan affected by the collapse of the World Trade Center Towers. The other is at Libby, Montana. As described below, and as recognized by the EPA, there is great scientific uncertainty in attempting to use dust sampling in these situations.

Libby Montana: At Libby**,** the EPA attempted to use dust sampling as a screening tool to determine which buildings would be cleaned. However, EPA has acknowledged it encountered scientific uncertainties, largely because of the inability to relate data from dust sampling with airborne levels that are used to determine risk. In the EPA report "*Libby Asbestos Site Residential/Commercial Cleanup Action Level and Clearance Criteria, Technical Memorandum Draft Final* - December 15, 2003" the difficulties were described,

> "Dust samples will be collected for those structures or levels of structures not containing visible vermiculite to determine if cleanup of those structures or levels is necessary. Unfortunately, establishing action levels based upon indoor dust levels is not straightforward. There are two primary reasons for this:
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> - Unlike air samples, **there are no established regulatory or health-based standards to guide the determinations of acceptable concentrations of asbestos in indoor dust.** (emphasis added)
> - The relationship between the concentration of asbestos in dust and the resultant concentration in air (the medium that actually determines human exposure and risk) is highly variable. This is because the relationship depends on a long list of different factors, most important of which is the nature and frequency of dust disturbance. This means that **it is difficult to calculate a value in dust that corresponds to an acceptable level in air**, (emphasis added) and it is even harder to try to select a level in dust based on site-specific measurements. This difficulty is discussed more in the Appendix."[1]

[1] EPA 2003. Libby Asbestos Site Residential/Commercial Cleanup Action Level and Clearance Criteria, Technical Memorandum, Draft Final. U.S. Environmental Protection Agency, Region 8. December 15, 2003. Page 6.

Risk due to active cleaning: EPA encountered the difficulties described above when it attempted to determine risk due to disturbance of dust during "active cleaning." This required an attempt to develop a "k" factor to relate the index of asbestos in dust to concentrations of asbestos in the air. EPA, however, was unable to develop a "k" factor from measurements they have made in houses, and instead used "k" factors reported in the literature for other circumstances.

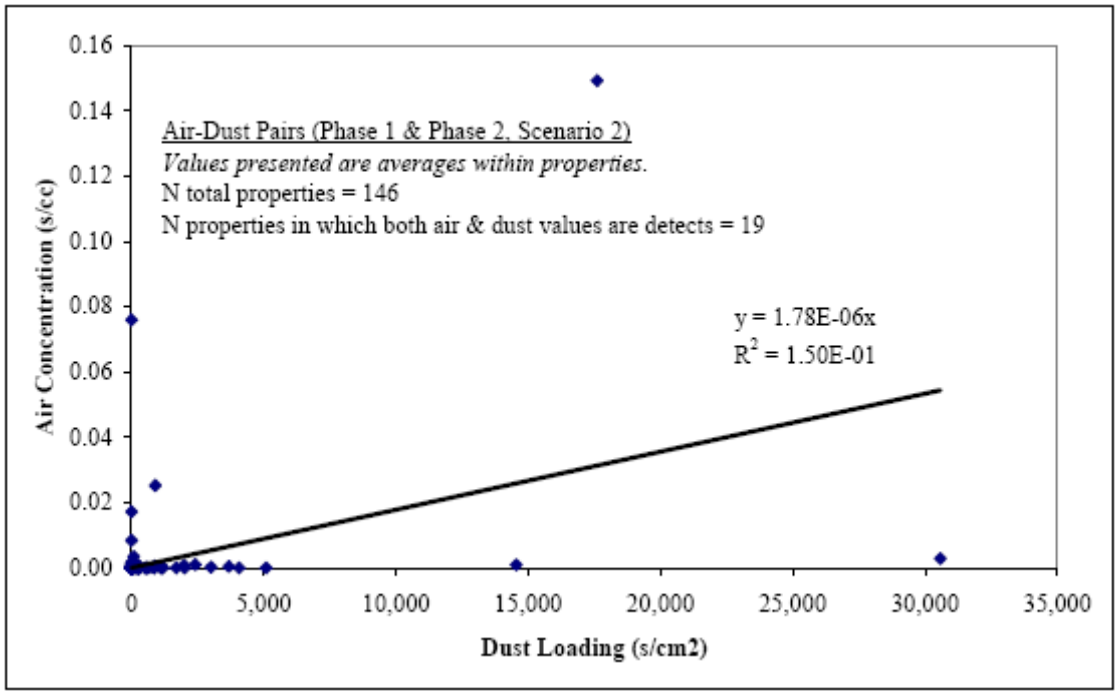
> "**There were no instances in which structures were detected in both air and dust at the same home. This prevents a meaningful analysis of the relationship in paired samples (as would be preferred).** (emphasis added)This result is partly a consequence of the statistical uncertainty around each measurement, as well as the inherent variability between different homes and different types of cleaning activities. While the site specific data are consistent with published estimates of K factors, the extreme variability and uncertainty of the site-specific data necessitates our usage of the literature-based estimates for active cleaning."[2]

In using the "literature based estimates" for a "k" factor, the EPA ignored the fact that the airborne asbestos measurements reported in the literature generally were the result of indirect preparation of air samples that were not corrected for the higher levels that result from indirect preparation as compared to direct preparation. This means that the "k" factors reported in the literature are based on artificially high airborne asbestos concentrations and, as a result, the EPA's use of such "k" factors are scientifically unreliable.

In fact, EPA concluded that the estimate of the "k" factor for "active cleaning" was highly variable and would result in large uncertainty in any risk assessment.

[2] EPA 2003 Op. Cit. Page A-13

Risk due to baseline residential activities: EPA's attempts to use dust sampling to assess exposure risk from "baseline residential activities" fared even worse. EPA collected 146 sample pairs, i.e., air and dust samples in the same house. Of those, only 19 had both air and dust levels above detection limits. As can be seen from the graph below, even the measurements that were above zero were very close to zero. Air levels hovered around zero even when the index of asbestos in dust in the same location exceeded 30,000 s/cm^2, and air levels reached almost 0.08 s/cc when dust levels in the same location were barely above zero. In short, as can be seen by an inspection of the graph below, there was no apparent relationship between asbestos dust and air levels. Inexplicably, the EPA then struck a line that passes through none of the data points to represent the supposed correlation between such dust and air levels (the "k" factor). This line is essentially meaningless as the data is clustered around the X and Y axes, indicating no correlation between the dust and air.



Graph from page 19 of Attachment 1 "Documentation Of Database Queries And Data Reduction"

EPA itself acknowledged the difficulty with determining a "k" factor from these data and explicitly identified its scientific limitations.

> Clearly, this value should be viewed as only a rough estimate, and it should be understood that actual values could vary substantially from home to home and from time to time.[3]

EPA summed up saying that there was a "substantial amount of uncertainty" in the risk estimates that result from use of this "k" factor describing the relationship between air and dust. This uncertainty results because there is no demonstrable relationship between the index of asbestos in dust and the airborne concentrations of asbestos upon which risk estimates must be based.

> "However, it is evident from the discussions of the equations and inputs above that **these risk-based values for dust should be viewed as estimates that contain a substantial amount of uncertainty. This uncertainty is due mainly to the uncertainty regarding the relationship between air and dust**, (emphasis added) as well as uncertainty in the relative contribution of different activity patterns to the average value of K. Thus, actual risk-based concentration (RBC) values may be either higher or lower, depending on the actual range of conditions that exist across the community of Libby."[4]

EPA's attempts at setting a risk-based action level to trigger cleaning of residences at Libby was frustrated by the lack of a demonstrable relationship between the index of asbestos in dust and the airborne concentration of asbestos generated by disturbance of that dust. As a result, EPA recognized the scientific unreliability and uncertainty of the dust methodology, acknowledging that there is a "substantial amount of uncertainty" in attempting to use surface dust sampling to assess risk based on such a relationship.

New York City: In the case of New York City**,** EPA completely abandoned any attempt at setting a risk-based action level for cleaning buildings contaminated by asbestos from the collapse of the World Trade Center towers. This was described in the "*World Trade Center Indoor Dust Test and Clean Program Plan*, Final November 2005." EPA set an action level of 5,000s/cm^2 for accessible areas to trigger cleanup of buildings, and a 50,000s/cm^2 action level for inaccessible areas.

EPA indicated that it preferred to use a risk-based approach to make decisions about which units to clean:

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[3] EPA 2003. Op. Cit. Page A-15

[4] EPA 2003. Op. Cit. Page A-15

> EPA's preferred approach to establishing cleanup benchmarks is risk-based.[5]

This is accomplished by determining the airborne concentrations of asbestos that the occupants of the units are exposed to.

> Asbestos and MMVF toxicity occurs primarily from inhalation exposure. Accordingly, the risk from asbestos and MMVF exposure would be assessed by determining fiber concentrations in air. Risk-based benchmarks for asbestos and MMVF in indoor air were developed in the COPC Report and will be employed in this program. [6]

Responding to public pressure**,** EPA decided to also sample settled dust and set an action level for cleaning based on these measurements. However, this action level was not risk-based.

> Concern was raised by members of the public and the panel that reservoirs of asbestos and MMVF may be present that might not be readily re-entrained during air sampling. Consequently, sampling for asbestos and MMVF in settled dust will also be performed in this program. **The benchmarks developed to trigger cleanup for asbestos and MMVF in settled dust are not risk-based.** (emphasis added)[7]

In fact, EPA specifically excluded any attempt at risk assessment based on dust sample results.

> "Earlier versions of this sampling plan discussed the capacity of asbestos and glass fibers to re-entrain in indoor air, and the possibility of developing settled dust benchmarks based on an inhalation pathway. **However, development of a "k" factor, which is an empirical factor relating a dust concentration to an air concentration, was not pursued for this sampling plan in accordance with recommendations of individual members of the panel, who cited the considerable uncertainty inherent in characterizing the relationship between fiber loads in indoor air and settled dust.** (emphasis added) Factors contributing to this uncertainty include surface porosity, activity patterns, fiber dimensions,

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[5] EPA 2005. World Trade Center Indoor Dust Test and Clean Program Plan, Final November 2005. Page 6

[6] EPA 2005. Op. Cit. Page 6

[7] EPA 2005. Op. Cit. Page 6

> room volume and air exchange rates. The peer reviewers of the COPC Report were also of this opinion." [8]

Initially, EPA proposed to use only dust sampling to determine what apartments would be cleaned. Significantly, EPA did make one change to their plan before it was released; this was to include air sampling for asbestos and man made vitreous fibers.

> "One notable change from the June 30, 2005, Draft Final Plan is the inclusion of air sampling for asbestos and man-made vitreous fibers (MMVF) in addition to surface sampling.… EPA believes that this addition is necessary to assure that scientifically defensible, health-based cleanup benchmarks are utilized for all contaminants of potential concern."[9]

The EPA is clearly struggling to come to grips with dust sampling. It has established the same action level for dust deposits in two locations despite the fact that the dusts contain different types of asbestos, have different composition and a different method of distribution. In the one case, EPA arrived at this level by purporting to use a risk assessment, but admitting the considerable scientific uncertainty in this analysis. At the World Trade Center site, on the other hand, the EPA has abandoned any pretext at risk assessment based on surface dust sampling**,** citing the uncertainty and unreliability of relating dust levels to air levels of asbestos. The EPA then included air sampling in order to have "scientifically defensible, health-based cleanup benchmarks."

Summary

The opinions in this report supplement my earlier report and are in response to certain issues raised in claimants' experts' reports.

One of claimants' experts claims that dust sampling is useful in hazard assessment. Dust sampling has a limited role only insofar as it can identify whether there is or is not asbestos in the dust on a surface. It does not quantify the asbestos as it is found in the dust on the surface, does not inform the hazard assessor if there is sufficient asbestos in the dust to trigger regulatory requirements, nor does it tell the assessor if there is an exposure risk. It is necessary to use air sampling to determine if there is an exposure risk from the

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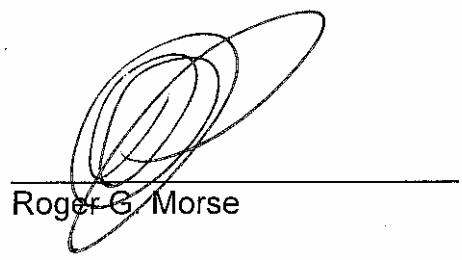
[8] EPA 2005. Op. Cit. Page 7

[9] Oppelt 2005. Letter from E. Timothy Oppelt, Interim Chair of the WTC Expert Technical Review Panel to the members of the panel. November 29,2005

asbestos in the dust. All regulatory agencies rely on bulk or air sampling to determine regulatory compliance or risk, and none rely on dust sampling.

Claimants' experts point out that the EPA is making use of dust sampling at Libby, Montana and New York City. However, as recognized by the EPA, there is great scientific uncertainty in EPA's attempt to use dust sampling in those situations. At Libby, EPA has acknowledged that there was great uncertainty in attempting a risk assessment based on dust sampling. This uncertainty arises because a scientifically reliable relationship between asbestos in dust on a surface and asbestos in the air could not be shown. EPA acknowledges this scientific uncertainty and abandoned any pretext of risk assessment for the situation in New York City. Thus, while EPA has attempted to use dust sampling, it has recognized and acknowledged the lack of any reliable scientific basis to do so.



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